CLAIMS:

1. A method of bonding a first mass to a second mass, comprising:

providing a first mass of first material and a second mass of second material;

joining the first mass and the second mass in physical contact with one another; and

simultaneously diffusion bonding the first mass to the second mass and developing grains of the second material in the second mass, the diffusion bonding comprising solid state diffusion between the first mass and the second mass, a predominate portion of the developed grains having a maximum dimension of less than 100 microns.

2. The method of claim 1 wherein all of the developed grains have the maximum dimension of the less than 100 microns.

3. The method of claim 1 wherein the maximum dimension of the predominate portion of the developed grains is less than or equal to about 50 microns.

4. The method of claim 3 wherein all of the developed grains have the maximum dimension of the less than or equal to about 50 microns.

5. The method of claim 1 wherein the maximum dimension of the predominate portion of the developed grains is from about 30 microns to less than 100 microns.

6. The method of claim 5 wherein all of the developed grains have the maximum dimension of from about 30 microns to less than 100 microns.

7. The method of claim 1 wherein the first material comprises a same predominate component as the second material.

8. The method of claim 1 wherein the first material comprises a same predominate element as the second material.

9. The method of claim 1 wherein the bonded first and second masses correspond to a backing plate and a physical vapor deposition target, respectively.

10. A method of bonding a physical vapor deposition target material to a backing plate material, comprising:

joining the target material and backing plate material in physical contact with one another; and

thermally treating the joined target and backing plate materials to simultaneously diffusion bond the target material to the backing plate material and develop grains in the target material, the diffusion bonding comprising solid state diffusion between the backing plate and target materials, a predominate portion of the developed grains having a maximum dimension of less than 100 microns.

11. The method of claim 10 wherein all of the developed grains have the maximum dimension of the less than 100 microns.

12. The method of claim 10 wherein the maximum dimension of the predominate portion of the developed grains is less than or equal to about 50 microns.

13. The method of claim 12 wherein all of the developed grains have the maximum dimension of the less than or equal to about 50 microns.

14. The method of claim 10 wherein the maximum dimension of the predominate portion of the developed grains is from about 30 microns to less than 100 microns.

15. The method of claim 14 wherein all of the developed grains have the maximum dimension of from about 30 microns to less than 100 microns.

16. The method of claim 10 wherein the backing plate material comprises a same predominate component as the target material.

17. The method of claim 10 wherein the backing plate material comprises a same predominate element as the target material.

18. The method of claim 10 wherein the backing plate material and target material both predominately comprise aluminum.

19. The method of ~~claim~~ 10 wherein the grain development comprises recrystallization of grains within the target material.

20. The method of claim 10 wherein the grain development comprises growth of grains within the target material.

21. The method of claim 10 further comprising, before the joining, work-hardening the target material.

22. The method of claim 10 further comprising, before the joining, work-hardening the target material by compressing the target material from an initial thickness to a final thickness, the final thickness being less than or equal to about 40% of the initial thickness.

23. The method of claim 10 further comprising, before the joining, work-hardening the target material by compressing the target material from an initial thickness to a final thickness, the final thickness being from about 40% to about 2% of the initial thickness.

24. The method of claim 10 further comprising, before the joining, work-hardening the target material, and wherein the grain development comprises recrystallization of grains from the work-hardened material.

25. The method of claim 10 further comprising, before the joining, work-hardening the target material, and wherein the grain development comprises:

recrystallization of grains from the work-hardened material; and

growth of the recrystallized grains.

26. A method of forming a physical vapor deposition target bonded to a backing plate, comprising:

joining a physical vapor deposition target material and backing plate material in physical contact with one another, the physical vapor deposition target and backing plate materials both comprising aluminum; and

thermally treating the joined physical vapor deposition target and backing plate materials under an atmosphere which is inert relative to reaction with the physical vapor deposition target and backing plate materials, the thermally treating simultaneously diffusion bonding the physical vapor deposition target material to the backing plate material and developing grains in the physical vapor deposition target material, the diffusion bonding comprising solid state diffusion between the backing plate material and the physical vapor deposition target material to adhere the physical vapor deposition target material to the backing plate material with a bond strength of at least about 5000 pounds/inch^2, and a predominate portion of the grains developed in the target material being less than 100 microns in maximum dimension after the thermally treating of the target and backing plate materials.

27. The method of claim 26 wherein the backing plate material and physical vapor deposition target material both predominately comprise aluminum.

28. The method of claim 26 wherein the grain development comprises recrystallization of grains within the physical vapor deposition target material.

29. The method of claim 26 wherein the thermally treating comprises maintaining the joined physical vapor deposition target material and backing plate material at a temperature of from about 280°C to about 400° for a time of from about 20 minutes to about 60 minutes and pressing the joined physical vapor deposition target and backing plate materials to a pressure of at least 12,500 pounds/in^2 during at least part of the time that the temperature is maintained.

30. The method of claim 29 further comprising cooling the joined physical vapor deposition target and backing plate materials with a liquid after the temperature treatment.

31. The method of claim 29 further comprising cooling the joined physical vapor deposition target and backing plate materials with a gas after the temperature treatment.

32. The method of claim 26 wherein the grain development comprises growth of grains within the physical vapor deposition target material.

33. The method of claim 26 further comprising, before the joining, work-hardening the physical vapor deposition target material.

34. The method of claim 26 further comprising, before the joining, work-hardening the physical vapor deposition target material by compressing the physical vapor deposition target material from an initial thickness to a final thickness, the final thickness being less than or equal to about 40% of the initial thickness.

35. The method of claim 26 further comprising, before the joining, work-hardening the physical vapor deposition target material by compressing the physical vapor deposition target material from an initial thickness to a final thickness, the final thickness being from about 40% to about 2% of the initial thickness.

36. The method of claim 26 further comprising, before the joining, work-hardening the physical vapor deposition target material, and wherein the grain development comprises recrystallization of grains from the work-hardened material.

37. The method of claim 26 further comprising, before the joining, work-hardening the physical vapor deposition target material, and wherein the grain development comprises:

recrystallization of grains from the work-hardened material; and

growth of the recrystallized grains.

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